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BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Secretary Of Energy

Low-Income Weatherization--Better Way Of Meeting Needs In View Of Limited Funds

Federal grants for low-income weatherization programs totaled more than \$2.5 billion between 1975 and 1985. States use the grants to weatherize low-income dwellings, thereby reducing residential fuel use. Currently, the main sources of federal funds are the Department of Energy's (DOE's) low-income weatherization program and the Department of Health and Human Services' Low-Income Home Energy Assistance Program. GAO estimates that if current policies, procedures, and funding are continued, most of the 17 selected states would not complete weatherization of all currently eligible dwellings until the 21st century. Even this is doubtful because of other factors such as potential increases in the number of eligible dwellings.

GAO believes that the program's cost-effectiveness and ability to weatherize more low-income dwellings could be improved if spending per unit was limited to those measures most cost-effective in terms of energy savings per dollar cost of weatherization. DOE could increase program cost-effectiveness and weatherize more dwellings by requiring that weatherization measure expenditures be limited to those repayable through potential energy savings within a specified number of years.



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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,
AND ECONOMIC DEVELOPMENT
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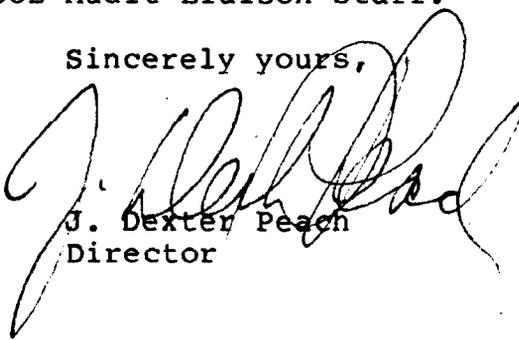
The Honorable John S. Herrington
The Secretary of Energy

Dear Mr. Secretary:

This report discusses how federal low-income weatherization efforts might reach more households and attain greater energy savings per dollar spent in view of the limited funds available for these efforts. It contains a recommendation to you on page 29. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of the report to the Secretary of Health and Human Services, the Director of the Office of Management and Budget, each of the state governors, and the appropriate committees of the Congress. We are also sending 15 copies of the report to the DOE Audit Liaison staff.

Sincerely yours,



J. Dexter Peach
Director



EXECUTIVE SUMMARY

Federal funding for low-income weatherization efforts was over \$2.5 billion from 1975 to 1985. Federal funding of low-income weatherization has been relatively stable since fiscal year 1982 while DOE's estimate of dwelling units eligible for low-income weatherization has increased. Therefore, GAO reviewed the status of weatherization efforts in selected states and sought to examine whether the limited weatherization resources could be more effectively used.

GAO reviewed low-income weatherization efforts in 17 states that in total received over two-thirds of federal low-income weatherization funds in fiscal years 1982 through 1984. GAO's purpose was to:

- Describe the various weatherization efforts undertaken in selected states and provide data on the future of weatherization in terms of dwelling units weatherized, expenditures, and time frame for weatherizing all eligible units.
- Examine whether the weatherization program could be more effective if fewer dollars were spent per unit by limiting weatherization to the most cost-effective measures.

BACKGROUND

Federal grants for low-income weatherization began in 1975 as a response to the fuel shortages and price increases caused by the 1973 oil embargo. Currently, the two main sources of federal funding are the Department of Energy's (DOE's) low-income weatherization program and the Department of Health and Human Services' (HHS') low-income home energy assistance program (LIHEAP). The programs provide low-income dwellings with various weatherization measures that can reduce residential fuel use. The DOE program currently limits the annual average expenditure per dwelling unit in each state to \$1,600 for a number of specified types of weatherization measures. States may set lower expenditure limits, and 7 of the 17 selected states did so. The LIHEAP program, a block grant program, leaves decisions on the maximum cost and types of measures to the states. (See pp. 1-3.)

EXECUTIVE SUMMARY

RESULTS IN BRIEF

GAO estimates that if current federal and state policies, procedures, and funding are continued, weatherization of all currently eligible dwellings would not occur for most of the 17 selected states until well into the 21st century. Even then, the program may not be complete because weatherization measures deteriorate with age and recently enacted legislation may increase eligible dwellings by as many as 8 million.

The current level of federal funding is not likely to increase. GAO believes that DOE's program could be made more cost-effective and could weatherize more low-income dwellings if weatherization measures were limited to those most cost-effective in terms of energy savings per dollar cost of weatherization. This could be done by establishing criteria applicable to all states that would result in limiting weatherization measures to those repayable through energy savings within the specified number of years.

PRINCIPAL FINDINGS**Progress and Outlook for Weatherization**

Through fiscal year 1984, DOE had weatherized about 1.4 million of the 14.4 million eligible dwellings. At the rate of progress made in fiscal years 1982-84, the most recent annual data available, under the LIHEAP and DOE programs, GAO estimates that 15 of the 17 selected states will require from 15 to 100 years to weatherize all eligible dwelling units. (See p. 8.) However, the following factors make even this rate of progress unlikely:

--Recent legislation required program regulatory changes (which became effective in 1985) that allowed states (1) the option of using more liberal LIHEAP income eligibility criteria, which could increase eligible dwelling units by about 8 million and (2) to spend an average rather than a maximum of \$1,600 per dwelling, which DOE concludes, may result in fewer dwellings weatherized.

--Some dwelling units weatherized in the earlier program years may need reweatherization before

EXECUTIVE SUMMARY

all dwellings are initially weatherized, because some weatherization measures have a life of 15 years or less.

Alternative for Assisting More Homes

DOE regulations provide for installing weatherization measures in order of cost-effectiveness on the basis of the cost of materials and installation, lifetime of materials, and the estimated annual fuel savings considering climatic differences. The number of measures installed varies considerably among states, depending on cost limits established per dwelling. Several states with limits of \$1,000 to \$1,300 told GAO that only the top three or four measures in terms of priorities were installed, whereas one state with a \$3,000 limit installed at least six measures in 50 percent of the dwellings. (See p. 24.)

DOE also administers the Residential Conservation Service Program, which requires large electric and gas utilities to offer to their customers energy audits and assistance in arranging for financing and installing weatherization measures. In this program the homeowner pays for the weatherization unlike the DOE low-income weatherization program where the federal government pays for weatherization. In the Residential Conservation Service Program, DOE-recommended weatherization measures are limited to those that repay their costs through potential energy savings in 7 years or less. The payback criteria was established on the basis that these recommended measures would be most cost-effective and likely to be installed by consumers.

If this or similar payback criteria had been required in the DOE low-income weatherization program, it is likely that only the first three or four weatherization measures in states with the coldest climates and highest fuel costs would be eligible for funding. (See p. 28.)

GAO believes that establishing payback criteria for the DOE low-income weatherization program would emphasize the most energy-efficient and most cost-effective measures, resulting in (1) maximum potential energy savings per dollar

EXECUTIVE SUMMARY

spent, (2) a lower average expenditure per unit in many states, and (3) more dwellings weatherized per year, but not to the same extent.

Under the LIHEAP block grant, by law and regulation, individual states are responsible for designing their own weatherization programs, including the establishment of maximum allowable costs and measures. Therefore, GAO makes no conclusions or recommendations concerning the use of LIHEAP funds for weatherization.

RECOMMENDATION

GAO recommends that the Secretary of Energy consider revising current program regulations governing prioritization of low-income weatherization program measures by establishing payback criteria. This would result in limiting weatherization measures to those that can be repaid through potential energy savings within the specified number of years. The appropriate number of years in the period could be based on a study of similar criteria in other programs and consultation with experts in the area. (See pp. 29 and 30.)

**AGENCY
COMMENTS**

GAO obtained official comments on this report from HHS and DOE. (See apps. VI and VII.) HHS replied that it reviewed the report and had no comments to make on it. DOE believed that GAO's recommendation has merit but that further study is needed to explore its impact on weatherization in the context of the multiple funding sources available.

C O N T E N T S

	<u>Page</u>
EXECUTIVE SUMMARY	i
CHAPTER	
1 INTRODUCTION	1
Implementation and administration of the DOE weatherization program	2
Implementation and administration of the LIHEAP weatherization program	3
Use of petroleum violation escrow funds for weatherization	4
Implementation and administration of the Solar Energy and Energy Conservation Bank	4
Objectives, scope, and methodology	5
2 PROGRESS OF WEATHERIZATION AND OUTLOOK	8
Recent program changes	9
Weatherization funding by source	10
Maximum cost per unit	12
Program results for 1982, 1983, and 1984	15
Future program results	21
Conclusion	23
3 MORE HOUSEHOLDS COULD BE SERVED BY USE OF ONLY THE MOST COST-EFFECTIVE MEASURES	24
DOE weatherization does not consider all cost-effectiveness factors	24
Use of 7-year payback criteria would require higher savings than are being attained	26
Potential impact of a 7-year payback	28
Conclusions	29
Recommendation	29
Agency comments and our evaluation	30
APPENDIX	
I Major federal funding of low-income weatherization efforts, fiscal years 1975-85	31
II List of states included in GAO's review	32
III Number of units weatherized by each of the 17 states under the DOE and LIHEAP programs, fiscal years 1982-84	33
IV Annual energy savings required in each of the 17 states in GAO's review for a 7-year payback, 1983 and 1984	34

V	List of selected state and DOE energy savings studies analyzed by GAO and significant problems noted	35
VI	Advance comments from the Department of Energy	36
VII	Advance comments from the Department of Health and Human Services	38

ILLUSTRATIONS

Table 2.1:	Weatherization funding from DOE and LIHEAP for fiscal years 1982-85 in the 17 states reviewed by GAO	11
Table 2.2:	Maximum cost limits during 1983 and 1984 per dwelling for the 17 states reviewed by GAO	13
Table 2.3:	Visited states that used LIHEAP funds to exceed DOE weatherization limits	15
Table 2.4:	Average spending to weatherize a unit for each of the 17 states for 1982-84	17
Table 2.5:	Michigan data, 1983 program year	19
Table 2.6:	Installation frequency of various weatherization measures	20
Table 2.7:	Weatherization progress through fiscal year 1984 and estimated years to complete eligible dwelling units for the 17 states reviewed by GAO	22
Table I.1:	Major federal funding of low-income weatherization efforts, fiscal years 1975-85	31
Table II.1:	List of states included in GAO's review	32
Table III.1:	Numbers of units weatherized by each of the 17 states under the DOE and LIHEAP programs, fiscal years 1982-84	33

Table IV.1: Annual energy savings required in each of the 17 states in GAO's review for a 7-year payback, 1983-84	34
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Table V.1: List of selected state and DOE energy savings studies analyzed by GAO and significant problems noted	35
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ABBREVIATIONS

BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
CSA	Community Services Administration
DOE	Department of Energy
EMD	Energy and Minerals Division
FY	fiscal year
GAO	General Accounting Office
HHS	Department of Health and Human Services
HRD	Human Resources Division
HUD	Department of Housing and Urban Development
LIHEAP	Low-Income Home Energy Assistance Program
ORNL/CON	Oak Ridge National Laboratory/Conservation
RCED	Resources, Community, and Economic Development Division
RCS	Residential Conservation Service
TC	total cost
USC	United States Code



CHAPTER 1

INTRODUCTION

Federal involvement with low-income¹ weatherization began in 1975 as a response to the fuel shortages and price increases resulting from the 1973 oil embargo. The first weatherization program was established in 1975 in the Office of Economic Opportunity [later changed to the Community Services Administration (CSA)]. The Congress discontinued funding this program beginning in fiscal year 1979. The Federal Energy Administration [now part of the Department of Energy (DOE)] was authorized to begin a similar weatherization program in fiscal year 1977, which is still in existence. Beginning in fiscal year 1982, states were authorized to use for weatherization of low-income dwellings, up to 15 percent of funds received from the Low-Income Home Energy Assistance Program (LIHEAP), administered by the Department of Health and Human Services (HHS). The Petroleum Violation Escrow Fund, administered by DOE, and the Solar Energy and Energy Conservation Bank, a component of the Department of Housing and Urban Development, also provided funds

¹The definition of low-income varies with each program. For the two principal programs covered in this report--DOE's low-income weatherization and HHS' LIHEAP--the definitions are as follows.

Low-income under the DOE program is defined by the Energy Conservation in Existing Buildings Act of 1976, as amended (42 U.S.C. 6861) as (1) at or below 125 percent of the poverty level determined in accordance with criteria established by the Director, Office of Management and Budget, except that the Secretary of Energy, on the basis of procedures established in the act, may set a higher poverty level or (2) the basis on which cash assistance payments were paid in the preceding 12 months under Titles IV and XVI of the Social Security Act or applicable state or local law. A recent change in the law (Public Law 98-558, Oct. 30, 1984) gives states the option of using the more liberal LIHEAP income eligibility limits.

Low-income under LIHEAP is defined as (1) households with income not exceeding the greater of 150 percent of the poverty level for the state or 60 percent of the state median income or (2) households in which one or more individuals are receiving aid to families with dependent children, supplemental social security income payments, food stamps, or certain veterans benefits.

for low-income weatherization. Federal funding of low-income weatherization from fiscal years 1975 through 1985 from all of these programs totaled over \$2.5 billion² (see app. I).

IMPLEMENTATION AND ADMINISTRATION
OF THE DOE WEATHERIZATION PROGRAM

The Energy Conservation in Existing Buildings Act of 1976, as amended (42 U.S.C. 6861), authorizes DOE to develop and implement a weatherization assistance program to assist in achieving a prescribed level of insulation in the dwellings of low-income persons, particularly the elderly and handicapped, in order to both aid those persons least able to afford higher energy costs and to conserve needed energy. DOE's program regulations in effect during the period of our review generally allowed up to a maximum of \$1,600 per dwelling for numerous weatherization measures, including reducing general heat waste (e.g., caulking, weatherstripping, and repairing broken windows, doors, and heating ducts); insulating attics, exterior walls, floors, and water heaters; modifying furnaces for greater efficiency; and installing storm windows and doors.³

Since its inception in fiscal year 1977 through fiscal year 1985, DOE program funding has totaled about \$1.4 billion.⁴ The program is carried out by granting funds to the states and the District of Columbia,⁵ which, in turn, redistribute funds to subgrantees (local governments, Native American tribes, and community action agencies) for program implementation.

The program is administered on a decentralized basis through DOE operations and support offices. DOE headquarters is responsible for establishing program development and implementation regulations, providing technical assistance to DOE operations and support offices, and reviewing and evaluating information received from them to ensure effective and uniform

²Since fiscal year 1985 had not ended when these data were obtained, the fiscal year 1985 funding amounts could change.

³Regulations effective February 4, 1985, changed the \$1,600 maximum per dwelling to an average of \$1,600 per dwelling weatherized in a state.

⁴Since fiscal year 1985 had not ended when these data were obtained, the fiscal year 1985 funding amounts could change.

⁵Allocations to the states are based on a formula in the DOE regulations that considers residential energy use and the number of low-income households for each state and the climatic differences among the states.

program implementation. The DOE operations and support offices are responsible for reviewing and approving annual weatherization applications, awarding grants, monitoring and evaluating the operation of the program, and reporting to DOE headquarters.

Each state is responsible for developing its own weatherization program, monitoring program implementation by subgrantees, and reporting regularly to the DOE support office in accordance with program regulations.

IMPLEMENTATION AND ADMINISTRATION OF THE LIHEAP WEATHERIZATION PROGRAM

LIHEAP is one of several block grants authorized by the Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35, Aug. 13, 1981). The purpose of LIHEAP is to assist low-income households in meeting their home energy costs.⁶ Among other things, the act permits states to transfer up to 15 percent of their grants for "low-cost weatherization" in low-income households. Federal requirements regarding the use of LIHEAP weatherization funds are minimal, and neither the act nor the regulations define "low-cost weatherization." Therefore, the program provides substantial flexibility for states in designing their programs, including the establishment of the maximum cost for weatherizing a dwelling, the types of measures to be installed, and income eligibility within the limit set in the act. Among the principal options available are the use of LIHEAP funds to (1) supplement the existing DOE program by increasing resources available for the same types of weatherization measures funded in the DOE program, (2) augment the DOE program by funding activities it does not allow--funding in excess of \$1,600 per household, funding of measures not allowed in the DOE program, and providing assistance to households with income exceeding the DOE program limit but within the LIHEAP program limit--and (3) develop specialized programs such as low-cost/no cost⁷ and furnace repair and replacement.

The estimated expenditures of LIHEAP funds by the states for low-income weatherization for fiscal years 1982 through 1985 totaled about \$739 million.

⁶GAO issued a report on this block grant program entitled, States Fund an Expanded Range of Activities Under Low-Income Home Energy Block Grant, GAO/HRD-84-64, June 27, 1984.

⁷This program usually furnishes inexpensive (not exceeding \$50) weatherization materials kits containing such materials as water flow controllers, furnace filters, and infiltration reducing items.

USE OF PETROLEUM VIOLATION ESCROW
FUNDS FOR WEATHERIZATION

Section 155 of the Further Continuing Appropriations Act, Fiscal Year 1983 (Public Law 97-377, Dec. 21, 1982) provided for the disbursement of up to \$200 million in petroleum violation escrow funds to the states. The states could use these funds for one or more of five federal energy conservation programs, including the DOE Weatherization Program and LIHEAP. Data available from 45 states (accounting for 90 percent of the \$200 million) indicated that about \$47 million was allocated for use in the DOE Weatherization Program. When used in the DOE Weatherization Program, these funds are subject to the rules and regulations governing the use of DOE Weatherization Program funds.

IMPLEMENTATION AND ADMINISTRATION
OF THE SOLAR ENERGY AND ENERGY
CONSERVATION BANK

The Solar Energy and Energy Conservation Bank, a component of the Department of Housing and Urban Development, was authorized by Title V, Subtitle A, of the Energy Security Act of 1980 (12 U.S.C. 3601 *et seq.*) to encourage energy conservation and the use of solar energy by providing financial assistance through loan subsidies and grants. A total of \$81.9 million was appropriated to the Bank for fiscal years 1982 through 1985. The program is implemented through the states, with participating states entering into cooperative agreements with the Bank, and operates through financial institutions that make loans for solar energy or energy conservation projects. Program funds are used to subsidize a portion of the loan principal amount or the interest rate, or to make matching grants.

Assistance is available to owners or tenants of residential, agricultural, or commercial buildings at all income levels for a wide variety of conservation and solar measures. The amount of assistance for energy conservation measures varies with income level. To be eligible for maximum energy conservation assistance, a family must have an income less than 80 percent of the median area income. This income level would generally be higher than the maximum income levels for eligibility in the DOE and LIHEAP weatherization programs. In addition to providing financial assistance for all of the types of measures permitted in the DOE program, the Bank's program also provides assistance for several measures not permitted in the DOE program.

OBJECTIVES, SCOPE, AND METHODOLOGY

In addition to the importance of the program mission and significant federal funding, our decision to evaluate federal low-income weatherization efforts was based on the following factors:

- Committee reports and legislative proposals have expressed the need to weatherize the remaining 13 million eligible low-income dwelling units within about 10 years.
- Congressional proposals, subsequently enacted, increased the maximum income limit for eligibility, which could result in adding several million dwelling units.
- Weatherizing the remaining 13 million eligible dwelling units is estimated by the Congressional Budget Office at \$28.5 billion; indications are that funding at this level is not likely to be made available.
- Progress through 1983 and funding levels in 1982-83 indicated that a considerable time span would be required to weatherize the remaining dwelling units.

The objectives of our evaluation of federal funding of low-income weatherization were to address the following:

- What are some of the various weatherization efforts being undertaken in selected states? On the basis of a continuation of these efforts and current policies, procedures, and funding levels, what is the future of weatherization in terms of the number of dwelling units completed, and the time span required to weatherize all eligible dwelling units?
- Could the weatherization program be more effective in terms of overall cost-effectiveness and reach a greater proportion of the low-income population if fewer dollars were spent per dwelling by limiting weatherization measures to those most cost-effective?

The studies we analyzed did not evaluate how people were behaving before and after weatherization and the effect of these behavior patterns on energy use (e.g., heating previously unheated rooms). Therefore, our report considers energy savings without any adjustment for changes in behavior patterns. We also did not evaluate or question the social benefits of low-income weatherization. In discussing the need to limit measures to those most cost-effective, we do not intend to imply that some measures are not beneficial or effective. Our basic premise was that in

view of the previously noted factors--large universe, unlikelihood of increased funding, and congressional desire to complete all weatherization in a certain period of time--weatherization funds can be used more cost effectively, thereby reaching more households.

Our evaluation included 17 states (see app. II). We included each state with fiscal year 1983 combined federal funding of \$8 million or more from the DOE and HHS programs, which accounted for about 70 percent of fiscal year 1983 federal weatherization funds. The selection included states from all areas of the nation, both urban and rural, and covered a wide range of climates and fuel costs. Our review of weatherization efforts in the 17 states included those funded by (1) the DOE low-income weatherization program, (2) petroleum violation escrow funds, (3) HHS-LIHEAP funds, and (4) state funds. Our review did not include weatherization funded by the Solar Energy and Energy Conservation Bank because the program (1) was not initiated by the states until fiscal year 1983 and (2) differs significantly from the other programs in income eligibility, allowable measures and costs, and method of implementation.

The following describes our basic approach and methodology:

--We made a detailed review of weatherization efforts in six states located in the areas covered by two DOE support offices--Boston and Chicago. The Boston office was selected for coverage of states where oil, a higher cost fuel than natural gas, is the principal fuel. Maine and Massachusetts were selected because they were the top two federally funded states of the six New England states. The Chicago office was selected because the six states it covers accounted for almost one-third of federal fiscal year 1983 funding. Minnesota and Wisconsin were selected because although they were similar in the size of their low-income populations and their climates, and both received large federal funding, their progress differed. Illinois and Michigan were selected because of sizable federal funding in 1983--third and fifth largest in the nation, respectively. In each state we reviewed and compared state and selected local agency policies, procedures, data, and records and interviewed responsible officials concerning funding, production, and goals; weatherization costs and cost limitations; weatherization measures used and priorities; program implementation methods; priorities for serving applicants; the universe of eligible low-income households; average fuel costs; and monitoring of local agencies for quality of workmanship, achievement of goals, and control of costs.

--We obtained a basic description of and collected data on each type of weatherization program implemented in each of the remaining 11 states. In each state we (1) interviewed state program officials concerning policies for each program on weatherization measure priorities, allocation of funds, production goals, priorities for serving applicants, weatherization cost limitations and program monitoring, (2) obtained data for each program on production and average weatherization costs, and (3) obtained statewide data on the universe of low-income households and average residential fuel costs.

--We analyzed low-income weatherization program energy savings studies performed by 10 of the 17 states and of a nationwide study performed by DOE.

We analyzed enacted and proposed weatherization legislation and program regulations, policies, and procedures governing the various federal weatherization funding sources. We also compared the energy savings results of the low-income weatherization program with the results of energy savings studies of a non-low-income weatherization program, the Residential Conservation Service (RCS) program.⁸ We obtained comments regarding various program aspects from responsible DOE field and headquarters officials. We also obtained official comments from DOE and HHS on this report (see apps. VI and VII).

We conducted our review between October 1983 and October 1984 in accordance with generally accepted government auditing standards. Our review of state programs generally included (1) program data for fiscal years 1982-84 and (2) state program policies and procedures in effect through fiscal year 1984.

⁸RCS was established by the National Energy Conservation Policy Act (42 U.S.C. 8211 et seq.) to facilitate and encourage the installation of energy conservation measures in existing residences. RCS requires large electric and gas utilities to offer their residential customers energy audits and, if requested, to assist their customers in arranging for the financing and installation of energy conservation measures. States are the primary administrators of their RCS programs and can tailor them to meet their needs. Utilities, with their energy expertise and established relations with the nation's households, were chosen as the primary implementors of RCS. DOE's primary responsibilities are the issuance of regulations governing the program and the approval or disapproval of state RCS plans. The end result of the RCS program is similar to that of the DOE weatherization program--the weatherization of a dwelling unit. The main difference is in who pays for the weatherization--in the DOE program it is the federal government, while in RCS it is the homeowner.

CHAPTER 2

PROGRESS OF WEATHERIZATION AND OUTLOOK

Since the DOE program began in 1977 through fiscal year 1984, weatherization has been completed for about 1.4 million of the estimated 14.4 million dwelling units occupied by eligible low-income persons. If the rate of recent progress continues, the time needed to weatherize all eligible dwelling units would range from 15 to 100 years in 15 of the 17 states included in our review. Even then the job may be far from complete because

- DOE believes that recently revised income eligibility regulations could increase the number of eligible households to as many as 22 million.
- Many weatherization measures are useful for 15 years or less. The need to repeat weatherization for dwelling units weatherized in the earlier program years therefore will occur before all units are initially weatherized.
- The number of dwelling units and eligible low-income persons varies over time due to the movement of low-income persons to different dwelling units and changes in household income levels that cause households to shift in or out of the program's income eligibility limit.

In 1983 legislation was introduced to accelerate the program's completion. This legislation authorized any funding that was needed to assure that all eligible dwelling units would be weatherized within about 10 years. Estimates showed, however, that the cost of financing this legislation would be very high, and the bill was not enacted. However, in recent years additional federal funds from sources outside DOE have been used to supplement the program. Of the 17 states we visited, 7 in 1983, 8 in 1984, and 10 in 1985 had other federal funds available exceeding what DOE provided for use in the weatherization program. The principal outside funding source was LIHEAP, and all of the states we visited used at least some LIHEAP funds for weatherization.

The increased progress expected from this additional funding, however, was partly offset by a trend to increased costs per unit. When the DOE program began in 1977, regulations generally limited weatherization costs under the DOE program to \$400 per unit. By 1980 regulatory changes had increased this limit to its current level of \$1,600 per unit. While this increase has allowed individual homes to be more extensively weatherized, it has also reduced the number of homes that can be weatherized each year.

RECENT PROGRAM CHANGES

In 1983 and 1984, bills were introduced in the House and Senate proposing significant program changes, including the completion of all eligible dwelling units within 10 years and authorization of sufficient funds to do so. This latter change was estimated by the Congressional Budget Office to cost \$28.5 billion.¹ Neither of these bills was enacted into law. However, several changes in DOE program rules were included in the Human Services Reauthorization Act (Public Law 98-558, Oct. 30, 1984). DOE program regulation amendments (10 C.F.R. 440), effective February 4, 1985, implemented the following legislative changes:

- States may opt to use LIHEAP income eligibility limits, which allow a higher income level of eligibility.
- Replacement furnaces and boilers were made an allowable program cost.
- States must spend at least 40 percent of their program costs on materials.
- The limit of \$150 per dwelling for incidental repairs was removed.
- Expenditures are not to exceed an average of \$1,600 per dwelling weatherized in each state, rather than a maximum of \$1,600 per dwelling.
- Dwellings partially weatherized in fiscal years 1976 through 1979 may be reweatherized.

According to DOE, the potential effects of these changes are that (1) the universe of eligible dwelling units may increase from 14.4 million to about 22 million and (2) states can spend more on each unit by averaging expenditures and fewer units may be weatherized.

In its fiscal year 1986 budget request, DOE proposes a 5-year phase-out of the program. This would be accomplished by a 20 percent per year decrease from the fiscal year 1985 funding level, concluding in fiscal year 1990.

¹Letter of January 23, 1984, to the Honorable James T. Broyhill, Committee on Energy and Commerce, House of Representatives, from Congressional Budget Office.

WEATHERIZATION FUNDING BY SOURCE

Since 1982 there have been two basic sources of weatherization funds--the DOE Low-Income Weatherization Assistance Program and the LIHEAP block grant, up to 15 percent of which may be used for weatherization. Funding for fiscal years 1982-85 from these two sources for the 17 states visited is summarized in table 2.1.

In fiscal year 1983 federal financing sources also included the Petroleum Violation Escrow Fund (referred to as "oil overcharge funds"). These funds were allocated to low-income weatherization by 8 of the 17 states visited, averaging about \$2 million per state. In addition, 4 of the 17 states reviewed have provided state funds for program operations during the period from fiscal years 1982 through 1984. Maine, Massachusetts, Michigan, and Minnesota provided state appropriated funds totaling \$3.0 million, \$3.8 million, \$5.7 million, and \$11.3 million, respectively.

**Table 2.1: Weatherization Funding from DOE and LIHEAP^a
for Fiscal Years 1982-85
in the 17 States Reviewed by GAO
(in millions)**

State	1982		1983		1984		1985 ^b	
	DOE	LIHEAP	DOE	LIHEAP	DOE	LIHEAP	DOE	LIHEAP
California	\$ 3.7	\$ 3.3	\$ 6.3	\$ 7.8	\$ 4.8	\$ 12.0	\$ 4.7	\$ 9.8
Illinois	8.7	6.4	14.8	15.5	11.4	14.8	11.7	18.0
Indiana	4.1	0	7.0	9.2	5.4	3.7	5.4	5.0
Iowa	3.6	1.2	6.1	5.5	4.7	4.4	4.6	4.8
Kentucky	2.9	2.7	4.8	3.3	3.7	3.2	3.7	4.0
Maine	2.3	3.4	3.9	3.7	3.0	3.8	3.0	3.8
Massachusetts	4.4	3.0	7.4	3.9	5.7	7.8	6.0	8.6
Michigan	10.2	5.4	17.3	5.4	13.2	4.4	12.6	4.5
Minnesota	7.5	10.4	12.8	9.6	9.8	1.9	9.5	4.5
Missouri	4.4	3.2	7.5	2.8	5.7	3.7	5.1	2.9
New Jersey	3.8	.3	6.4	4.5	5.0	4.9	5.1	4.9
New York	15.0	29.9	25.5	21.9	19.5	24.6	19.4	31.4
Ohio	8.4	11.6	14.3	14.4	10.9	15.3	10.8	16.4
Pennsylvania	10.3	2.1	17.5	11.5	13.4	11.4	12.5	7.8
Tennessee	2.5	2.1	4.3	3.0	3.3	1.1	3.4	3.1
Washington	2.6	1.9	4.5	2.1	3.4	4.6	3.8	4.7
Wisconsin	5.6	9.9	9.5	6.0	7.3	8.9	7.4	10.9
Total - 17 states	\$100.0	\$ 96.8	\$169.9	\$130.1	\$130.2	\$130.5	\$128.7	\$145.1
Total - all states	\$143.0	\$136.2	\$242.3	\$195.5	\$187.0	\$195.9	\$187.0	\$211.1
17 states as a percentage of all states	70	71	70	67	70	67	69	69

^aLIHEAP data are obtained periodically by HHS through conducting telephone surveys of the states.

^bSince these data were obtained before the close of the fiscal year, the funding amounts could change.

Source: DOE data from annual state allocation reports obtained from DOE's Weatherization Assistance Programs Division. LIHEAP data from annual reports on LIHEAP published by the Office of Energy Assistance, Social Security Administration, HHS.

As permitted under LIHEAP legislation, a number of states applied more liberal rules to the use of LIHEAP funds for weatherization than were allowed in the use of DOE program funds. Nine states permitted installation of additional measures or special projects not allowed in the DOE program. Five states allowed higher income criteria to determine eligibility than allowed in the DOE program. Details of these uses are described in a later section.

MAXIMUM COST PER UNIT

From calendar years 1980 through 1984, the maximum weatherization cost per dwelling unit under the DOE program was \$1,000 unless a state requested and the DOE regional office approved a material and/or labor waiver allowing the state to exceed this limit. The material waiver was limited to the specific amount requested and approved, while the labor waiver was limited to \$1,600.² Some states have imposed additional limits on material or other program support costs, which are lower than the DOE \$1,600 limit. Table 2.2 shows the cost limits for each of the states we visited, including limits on material and program support costs. We note that higher limits than cited in the table were sometimes allowed by special waiver.

²As previously discussed, effective February 1985 this limit was changed to an average of \$1,600 per dwelling weatherized in each state.

Table 2.2: Maximum Cost Limits During 1983 and 1984 per Dwelling for the 17 States Reviewed by GAO

State	Cost limits for 1983 ^a			Cost limits for 1984		
	Total	Material	Program support	Total	Material	Program support
California	\$1,000	b	b	Same limits as 1983		
Illinois	1,600	\$ 600	\$1,000	Same limits as 1983		
Indiana	1,600	37%TC	63%TC	Same limits as 1983		
Iowa	1,000	\$ 500	\$ 500	Same limits as 1983		
Kentucky	1,500	b	b	Same limits as 1983		
Maine	1,600	\$ 700	\$ 900	Same limits as 1983		
Massachusetts	1,319	\$ 560	\$ 759	\$1,600	\$ 560	\$1,040
Michigan	1,600	\$ 560	b	Same limits as 1983		
Minnesota	1,600	\$ 750	b	\$1,600	\$ 750	b
Missouri	1,000	\$ 500	\$ 500	Same limits as 1983		
New Jersey	1,000	b	\$ 500	Same limits as 1983		
New York	1,600	\$1,000	\$ 600	\$1,600	\$1,000	\$ 600
Ohio	1,867	\$ 560	\$1,307	\$1,867	\$ 560	\$1,307
Pennsylvania	1,000	\$ 400	\$ 600	Same limits as 1983		
Tennessee	1,000	48%TC	52%TC	\$1,200	\$ 680	\$ 520
Washington	1,600	\$ 600	\$1,000	\$2,300	\$1,300	\$1,000
Wisconsin	3,000	\$1,000	65%TC	\$3,000	\$1,000	65%TC

^aExpressed as either a dollar limit or a limit in terms of a percentage of total cost (TC).

^bNo limit established for this cost category.

Source: Data gathered by GAO from state weatherization program offices.

Only Ohio, Washington, and Wisconsin allowed maximum costs per unit in excess of \$1,600. Washington received an approved material waiver from DOE, but the waiver applied only to certain homes that meet specific criteria. Ohio and Wisconsin use LIHEAP funds to pay for costs in excess of \$1,600.

State weatherization agency officials said that it was not always practical to effectively ensure compliance with prescribed cost limits. States required subgrantees to account for material expenditures for each unit weatherized. The states did not require such an accounting for labor and overhead because subgrantees did not have accounting systems adequate for allocating such costs. Thus, states required only that

subgrantees keep each year's average program support costs within the prescribed limits. A previously described 1985 regulatory change now allows this procedure.

Fourteen states have also limited the percentage of weatherization costs that subgrantees can incur for program support. An official of one of these states said that the purpose of the limit was to create an incentive to install materials efficiently. In addition, he said that the limit was meant to ensure that subgrantees spend a reasonable portion of funds on materials because state officials believed that inordinate expenditures for program support could result in less effective weatherization due to insufficient materials. The support cost limit ranged from 43 to 71 percent of total weatherization costs. States that have adopted such limitations include Illinois, Indiana, Iowa, Maine, Massachusetts, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Washington, and Wisconsin.

While limits on support costs may have been in some ways beneficial, they may also have had some detrimental effects. For example, although weatherization measures that prevent infiltration (e.g., weatherstripping and caulking) are generally the highest priority and therefore considered the most cost-effective, according to state weatherization officials they also require the most labor to install and thus have the highest labor costs. If subgrantees were to put primary emphasis on installing such high labor cost measures frequently without offsetting these costs by installing high material/low labor cost measures such as storm windows, they could exceed the support cost limit. A recent study of the Wisconsin program³ indicates that the limit may encourage subgrantees to use measures that emphasize materials--installation of storm windows, for example--rather than using measures that could provide the greatest energy savings per dollar spent. The study noted that Wisconsin established a \$1,000 materials limit while at the same time it encouraged local agencies to spend up to this maximum. The study noted that this policy encouraged local operators to spend a near maximum amount in materials on every dwelling unit, not an optimum material cost based on energy savings or payback.

Eleven states wanting to install weatherization measures more extensive than permitted by the DOE program, or to weatherize households with incomes exceeding DOE limits, used

³Low-Income Weatherization Program Study, Volume 2: Policy Recommendations, October 31, 1984, prepared by the Wisconsin Energy Conservation Corporation under contract with the State of Wisconsin, Department of Administration, pages 29-30.

LIHEAP funds for this purpose. Minnesota and Michigan, for example, repaired or replaced chimneys, roofs, and furnaces. The DOE program limits such repairs to incidental items costing less than \$150 for each home. Indiana used LIHEAP funds to repeat weatherization done at homes during the program's early years, a practice not allowed by the DOE program until 1985. Weatherization done in the early years sometimes was considered to have been of poor workmanship or materials. Five states used LIHEAP funds to weatherize homes of families whose incomes were more than 125 percent of the poverty level, the limit required until 1985 under the DOE program. Details of these exceptions are provided in table 2.3.

Table 2.3: Visited States That Used LIHEAP Funds to Exceed DOE Weatherization Limits

<u>State</u>	<u>Used for additional measures or special projects not allowed in DOE program</u>	<u>Used for weatherizing households with incomes exceeding DOE limits</u>
California	Yes	Yes
Indiana	Yes	No
Iowa	No	Yes
Michigan	Yes	No
Minnesota	Yes	No
Missouri	No	Yes
New Jersey	Yes	Yes
New York	Yes	Yes
Ohio	Yes	No
Washington	Yes	No
Wisconsin	Yes	No

Source: Data gathered by GAO from state weatherization program offices.

PROGRAM RESULTS FOR 1982, 1983, AND 1984

Under the DOE program, the 17 states weatherized annually from 1982 through 1984 totals of about 107,000, 103,000, and 144,000 dwelling units, respectively. (See app. III.) Six states (Illinois, Michigan, Minnesota, New York, Ohio, and Pennsylvania) accounted for about 60 percent of the annual production. Using LIHEAP funds, the 17 states also provided

weatherization services to about 378,000, 404,000, and 154,000 dwelling units in fiscal years 1982, 1983, and 1984, respectively. However, adding the DOE and LIHEAP data together may, for many states, overstate the number of dwelling units fully weatherized, because of the following problems noted. The type of weatherization services provided with LIHEAP funds varied among states and was not always comparable to the full-scale DOE weatherization. In several states all or a portion of LIHEAP funds were used for low-cost weatherization or furnace retrofit projects. For example, for fiscal year 1983 Massachusetts reported 28,463 dwelling units weatherized with LIHEAP funds, 27,540 of which received only low-cost weatherization. In addition, as noted in table 2.3, 9 states used LIHEAP funds to perform weatherization measures more extensive than allowed with DOE program funds. Therefore, some of the dwelling units reported as receiving LIHEAP weatherization services may also have received DOE weatherization.

Since the inception of the weatherization program, the amount spent per dwelling unit for weatherization has generally increased each year. For example, in our prior report on the DOE program, we noted that the average amount spent per unit increased from \$490 in calendar year 1979 to \$790 in August 1980.⁴ The average amount spent for 1983 in the DOE program in 10 of the 17 states we visited ranged between \$1,000 and \$1,500. While inflation has been partially responsible for the increases, spending per unit has risen also because the use of voluntary or donated labor was nearly eliminated. During its early years, the program used Comprehensive Employment and Training Act and volunteer labor almost exclusively, and although this labor was provided without cost to the program, the quality of the laborers' workmanship was often criticized by state and local agency weatherization officials. The program's subsequent use of skilled and semiskilled labor has eliminated much of the criticism, but it has resulted in higher costs. For example, in Wisconsin the hourly labor rate for installing weatherization measures ranged from \$3.35 to \$6.54, except in Milwaukee where up to \$14.65 was paid. In addition, the increase in material cost limits has allowed an increase in the number of measures installed.

Table 2.4 shows average spending per dwelling unit during the 1982, 1983, and 1984 program years for the 17 states reviewed.

⁴Uncertain Quality, Energy Savings, and Future Production Hamper the Weatherization Program (EMD-82-2, October 26, 1981) page 11.

Table 2.4: Average Spending to Weatherize a Dwelling Unit
for Each of the 17 States for 1982-84

State	Program ^a	Average spending per dwelling unit for program year		
		1982	1983	1984
California	DOE	\$ 601	\$ 526	\$ 476
	LIHEAP	738	661	602
Illinois	DOE and LIHEAP	1,325	1,493	1,222
Indiana	DOE and LIHEAP	1,037	1,021	1,125
Iowa	DOE	802	892	850
	LIHEAP	1,107	896	1,000
Kentucky	DOE	1,067	1,383	1,242
	LIHEAP	1,240	1,218	1,364
Maine	DOE	1,091	1,187	1,411
	LIHEAP	1,044	1,334	1,566
Massachusetts	DOE	1,099	1,140	1,131
	LIHEAP	None	1,045	1,099
Michigan	DOE and LIHEAP	1,337	1,213	1,442
Minnesota	DOE and LIHEAP	1,221	1,212	1,450
Missouri	DOE and LIHEAP	897	1,218	958
New Jersey	DOE	814	955	751
	LIHEAP	1,069	773	1,053
New York	DOE	1,187	1,224	1,348
	LIHEAP	1,197	1,173	1,418
Ohio	DOE and LIHEAP	1,767	1,594	1,611
Pennsylvania	DOE	700	878	896
	LIHEAP	593	789	850
Tennessee	DOE	759	900	834
	LIHEAP	736	706	777
Washington	DOE and LIHEAP	1,308	1,463	1,237
Wisconsin	DOE and LIHEAP	1,686	2,124	1,914

^aWhere separate DOE and LIHEAP figures are listed for a state, the figures represent the average expenditure for each program. States with a single figure listed as "DOE and LIHEAP" combined the two funding sources and did not maintain records on spending per unit for each program.

Source: Data gathered by GAO from state weatherization offices.

Program measures and priorities

DOE weatherization regulations require that the most cost-effective weatherization measures be installed first in each dwelling unit. The cost-effectiveness and priority of measures are determined by audit procedures using the following formula:

$$\frac{\text{Cost of fuel saved}^5 \times \text{lifetime of material}}{\text{Cost of material} + \text{cost of installation}}$$

Until January 1984, states were required to use Project Retro-Tech audit procedures to identify the most cost-effective weatherization measures.⁶ The guidelines for Project Retro-Tech require states to select the types of dwelling units typically found in the state and, for each type, to determine appropriate weatherization measures on the basis of eight sources of heat loss.⁷ The states then prioritize these measures using the estimated installation cost and anticipated potential fuel savings.

In all 17 states GAO reviewed, priorities were arranged in descending order of payback--as subgrantees move farther down the priority list, the additional potential fuel savings from spending an additional dollar declines. How far an agency can move down the priority list depends on the total funds available, the material dollar maximums per unit, and whether or not an agency is allowed to skip measures.

⁵This measures the potential fuel savings. In this report we use two terms in reference to energy savings--potential and actual. Potential savings are based on engineering estimates of the energy that should be saved by a specific measure. Actual savings are based on a comparison of actual energy bills before and after weatherization after adjustment for differences in weather conditions.

⁶A DOE guidance manual providing procedures for states to follow in calculating the cost-effectiveness of various weatherization measures and ranking them by priority for different types of dwelling units.

⁷The eight sources of heat loss are general heat waste, uninsulated ceilings, partially uninsulated ceilings, exposed floors, uninsulated perimeter, uninsulated floors, uninsulated walls and single glass windows. Because of the broadness of the general heat waste source, its treatment as a single measure or as a number of measures varies among states. Since the other sources involve more specific fixes, they are each generally covered by a single measure.

Although we found differences in the order of the weatherization priorities from state to state, these differences usually were not significant. The first priority was either general heat waste or caulking and weatherstripping for all dwelling types in all states. However, the activities categorized as general heat waste measures varied. For example, water heater insulation was considered a general heat waste measure in Massachusetts, Minnesota, and Wisconsin; was an optional general heat waste measure in Maine; was priority 2 in Iowa and Pennsylvania; and did not appear on the weatherization list until priority 5, 6, or 7 in New Jersey and New York, depending on the dwelling type. The next few priorities usually involved insulation of attics, perimeters, floors, and walls in varying orders. The installation of storm windows and doors generally was among the lowest priorities.

Data on the frequency of installation of each of these various measures were not readily available for the 17 states, except for Michigan or where states occasionally made special studies of program operations. The Michigan data covered only total material expenditures for various measures, but did not indicate the number of dwelling units receiving each measure. Michigan data for the 1983 program year is shown in table 2.5. Table 2.6 summarizes data from three special state studies, made in 1983 and 1984, that also provided some indication of the frequency patterns.

Table 2.5: Michigan Data
1983 Program Year

<u>Measure</u>	<u>Percentage of 1983 materials expenditures</u>
Caulk and weatherstrip	34
Insulate attic	20
Install storm windows	39
Insulate floor	5
Insulate water heater and sidewalls	2

Table 2.6: Installation Frequency of
Various Weatherization Measures

<u>Measure</u>	<u>Percentage of homes installed</u>		
	<u>1983 Kentucky study</u>	<u>1983 Minnesota study</u>	<u>1984 Wisconsin study</u>
Caulk and weatherstrip	81.1	96.4	99.5
Insulate water heater	a	56.2	82.5
Insulate pipes and ducts	4.5	a	73.0
Insulate attic	85.6	61.1	67.7
Install storm windows	46.2	35.0	64.8
Install storm doors	a	38.6	35.4
Insulate walls	13.6	29.1	6.9
Insulate floors	17.4	16.7	a

^aNot listed as a separate measure.

Source: Energy savings studies obtained from the cited state weatherization program offices.

States that had set higher cost limits were generally able to complete more low-priority work than states that had set lower limits. Weatherization program officials of three northeastern states, with 1983 cost limits varying from \$1,000 to \$1,300, indicated that their local agencies usually can install no more than the first three or four priorities. For example, Pennsylvania weatherization officials said that because of the \$1,000 limit, local agencies usually complete only as much as the fourth priority--attic insulation. In contrast, a study of Wisconsin weatherization, where the 1983 cost limit was \$3,000, indicated that 50 percent of the homes had at least six measures completed. Storm windows--priority number six for Wisconsin--were installed on about two-thirds of the homes.

States with higher cost limits often installed storm windows and doors, generally a low priority. Storm windows or doors were installed extensively in Illinois, Michigan, and Wisconsin. For example, in 1983 about 39 percent of the material expenditures in Michigan were for storm windows. Our analysis of records at selected local weatherization agencies covering Chicago and parts of Wisconsin indicated that in 1983, 52 percent and 34 percent, respectively, of their materials expenditures were for storm windows.

Single family units having attics and basements usually require more extensive measures than multifamily housing. Many multifamily units had no attics or basements and often had exterior walls made of brick or slate that could not be easily penetrated for insulating. Therefore, in many multifamily housing units more funds were available for lower priority work, which, for example, allowed for replacement of more storm windows and doors than was allowed in single family units. For locations in Iowa and Illinois, we found that a majority of the expense for work being done in multifamily housing was for storm windows and doors.

In addition to prioritizing weatherization measures, states also generally urged or required local agencies to give weatherization priority to dwellings of certain families--the aged and handicapped and those who occupy rental units. States usually established a minimum goal for weatherizing these types of dwellings and required outreach activities to achieve their goals.

FUTURE PROGRAM RESULTS

States' progress in weatherizing their eligible dwelling units was influenced primarily by the amount spent per household and the total funds available to each state. Minnesota and Maine, cold-weather states that have allowed a maximum expenditure per dwelling of \$1,600, spent an average per dwelling of \$1,200 to \$1,400 in 1983 and 1984, and obtained additional funding from local sources, achieved relatively high rates of weatherization progress (52 and 37 percent of eligible dwelling units completed, respectively). In contrast, Wisconsin, which allowed maximum expenditure per dwelling of \$3,000, and spent an average per dwelling of \$1,900 to \$2,100 in 1983 and 1984, had weatherized only about 22 percent of its eligible dwelling units by the close of fiscal year 1984. All three of these states funded weatherization from both DOE and LIHEAP. The primary difference was that Wisconsin used LIHEAP funds to exceed the DOE \$1,600 limit per dwelling unit, whereas Maine and Minnesota did not exceed the limit. As previously noted, efforts to increase funding to complete weatherization in 10 years were unsuccessful. Funding for the past 2 years has been stable, but the administration proposes a reduced funding level.

On the basis of the eligibility estimate of 14.4 million dwelling units, the progress of weatherization through fiscal year 1984, and the average annual number of dwelling units weatherized from fiscal year 1982 through fiscal year 1984, we estimate that 15 of the 17 states had weatherized less than one-third of their eligible dwelling units, and would require

periods ranging from 15 to 100 years to weatherize their remaining eligible dwelling units. Only two states (Maine and Minnesota) would likely complete all eligible weatherization within 10 years, and 12 states would not complete the process until the 21st century. Table 2.7 summarizes these estimates.

Table 2.7: Weatherization Progress through Fiscal Year 1984 and Estimated Years to Complete Eligible Dwelling Units for the 17 States Reviewed by GAO

<u>State</u>	<u>Number of eligible dwelling units</u>	<u>Weatherized through FY 1984</u>		<u>Number of eligible dwelling units</u>		<u>Estimated years to complete weatherization</u>
		<u>Number</u>	<u>Percentage of eligible</u>	<u>Not weatherized at close of FY 1984</u>	<u>Average weatherized annually, FY 1982-84</u>	
	----- (thousands) -----			----- (thousands) -----		
California	1,350	66	5	1,284	14	92
Illinois	615	77	13	538	15	36
Indiana	289	63	22	226	12	19
Iowa	166	45	27	121	8	15
Kentucky	309	45	15	264	5	53
Maine	82	30	37	52	5	10
Massachusetts ^a	327	27	8	300	3	100
Michigan	500	88	18	412	17	24
Minnesota	221	116	52	105	21	5
Missouri	339	71	21	268	9	30
New Jersey	358	43	12	315	10	32
New York ^a	1,214	105	9	1,109	15	74
Ohio	599	116	19	483	28	17
Pennsylvania	684	181	26	503	32	16
Tennessee	380	37	10	343	5	69
Washington	233	30	13	203	4	51
Wisconsin	238	52	22	186	11	17

^aDoes not include LIHEAP production for these states as they indicated that LIHEAP production consisted primarily of low-cost/no cost weatherization and furnace retrofit.

Source: GAO analysis of data obtained from (1) Weatherization Assistance Programs Division, DOE, and (2) HHS annual reports on LIHEAP.

DOE's most recent estimate of 14.4 million eligible dwelling units is an increase over its prior estimate of 12.6 million dwelling units. Also according to DOE, the recent rule change allowing states to use LIHEAP income eligibility

standards may increase the universe of eligible homes to about 22 million. For states opting to use these standards, both the number of eligible households and the years needed to complete all weatherization would probably increase significantly. The number of eligible dwelling units will also be affected by the movement of low-income persons to different dwelling units and changes in household income levels.

CONCLUSION

Because of the large universe of eligible dwelling units and the sizable cost required to weatherize all those eligible, the weatherization program delivers full benefits to a limited number of eligible households annually. The current level of federal funding is not likely to increase. As a result, weatherization of many households will not likely occur before the turn of the century, if at all. If recent years' progress continued, in 15 of the 17 states we reviewed the time needed to weatherize all eligible dwelling units would range from 15 to 100 years. However, this is unlikely to happen because (1) recently revised regulations on income eligibility could increase the universe of eligible homes to as much as 22 million and (2) before all households are completed, weatherization for some dwelling units weatherized in the earlier program years may have to be repeated because of deterioration.

CHAPTER 3

MORE HOUSEHOLDS COULD BE SERVED BY USE OF ONLY THE MOST COST-EFFECTIVE MEASURES

Concerning the use of LIHEAP funds for weatherization, the pertinent act and regulations have given the states substantial flexibility to design their own programs, including the establishment of allowable costs and measures. Therefore, since under LIHEAP, establishing cost and measure criteria are state responsibilities, we make no conclusion or recommendation concerning the use of LIHEAP funds for weatherization.

The DOE low-income weatherization program could reach more households and increase its cost-effectiveness by limiting weatherization measures only to those most cost-effective. This could be effected by establishing payback criteria on the expected number of years within which the weatherization investment must be potentially repayable in energy savings. Current DOE requirements do not consider any payback criteria as does the RCS program. The RCS, a federally established and regulated program to promote homeowner installation of energy conservation measures similar to those used in the low-income weatherization program, is based on a 7-year payback requirement.

Application of a 7-year payback requirement such as in the RCS program indicated that, on the basis of 1983 and 1984 average per-unit expenditures for weatherization and heating fuel, 14 of the 17 selected states would need to achieve energy savings levels ranging from one-half higher to four times higher than the more reliable state and DOE energy saving studies we reviewed indicate is achievable. If such a requirement were in effect, it is likely that for many states

--fewer measures would be installed per unit causing both the average expenditure and potential energy savings per unit to decrease and the potential energy savings per dollar spent to increase and

--more units would be weatherized causing total potential program energy savings to increase.

DOE WEATHERIZATION DOES NOT CONSIDER ALL COST-EFFECTIVENESS FACTORS

As discussed in chapter 2, DOE regulations (10 C.F.R. 440.21) provide procedures for prioritizing weatherization measures on the basis of each measure's cost-effectiveness, with the most cost-effective measures to be installed first. However, the number of measures installed is limited only by the overall cost limits set by DOE and the states. In contrast, RCS

program regulations (10 C.F.R. 456) provide for a maximum payback period of 7 years for program measures to be eligible. DOE selected the 7-year-payback criteria to limit program measures to only those most cost-effective and most likely to be installed by consumers.

Among the principal factors that DOE regulations require consideration of in determining the cost-effectiveness of low-income weatherization are the following:

- Total expenditures for each weatherization measure installed, including costs of material, direct labor, and indirect costs such as a share of the local weatherization agency's administrative costs and supervisory labor.
- The estimated potential annual fuel savings from installing each measure, considering climatic differences among areas.
- The lifetime of the materials installed for each measure.

According to state officials, local weatherization agencies generally follow these priorities and install as many measures as total and/or material cost limits will allow. This can vary considerably, depending on cost limits established in each state. As noted in chapter 2, weatherization program officials of three northeastern states, where 1983 cost limits varied from \$1,000 to \$1,300, stated that their local agencies usually can install no more than the first three or four priorities. In contrast, a study of Wisconsin weatherization, where the 1983 cost limit was \$3,000, indicated that 50 percent of the homes had at least six measures completed. Storm windows, which we noted in chapter 2 were generally ranked as a low priority in terms of cost-effectiveness, were installed on about two-thirds of the Wisconsin homes in the sample study.

The RCS program considers a factor that the DOE program does not consider--criteria on the expected number of years within which the cost of weatherization could be repaid in fuel savings. RCS regulations (10 C.F.R. 456) provide that each state must have an RCS plan which, among other things, requires covered utilities to provide upon request to their customers a program audit addressing the applicable program measures and the estimated costs and energy savings of each. The RCS regulations provide that states need only require utilities to perform audits for those measures with a simple payback of 7 years or less. States are also given the flexibility to add measures that pay back in more than 7 years, if they so desire. DOE developed a table of weatherization measures by evaluating program measures with respect to a prototypical house for each

climate zone and category of residential fuel use in each state. A measure was determined to be a program measure for a climate zone and category of fuel use if the payback was 7 years or less on the basis of the following formula:

$$\frac{\text{Cost of materials less federal and state} \\ \text{and installation} \quad \quad \quad \text{income tax credits}}{\text{Potential first-year energy savings}}$$

In explaining and justifying the RCS regulations, DOE stated that by not requiring the audit to address any measure with a simple payback of more than 7 years, the audit will include only those measures that are the most cost-effective and most likely to be considered seriously by consumers.¹ DOE believed that the average homeowner was not likely to invest in retrofit measures with paybacks of more than 7 years and gave the following example from a homeowner's perspective over a 5-year period. It was assumed that the homeowner invested \$1,000 in weatherization measures with a 10-year payback, an interest rate of 15 percent on a 5-year note, and escalation of fuel prices at 10 percent per year. At the end of 5 years, DOE estimates that the homeowner would have saved about \$611 in fuel bills while paying out \$1,427 in principal and interest.²

USE OF 7-YEAR PAYBACK CRITERIA
WOULD REQUIRE HIGHER SAVINGS THAN
ARE BEING ATTAINED

Application of a 7-year payback requirement to weatherization program investments in the 17 states would require for most states an annual reduction in fuel use

¹47 Federal Register 27763.

²"Regulatory Impact Analyses, Residential Conservation Service Program," June 1982, Office of Building Energy Research and Development, Assistant Secretary for Conservation and Renewable Energy, DOE, pages 2-7 and 2-8.

higher than most recent state and DOE energy-savings studies that we reviewed indicate are being attained by low-income weatherization.³

Our analysis in the 17 states of average weatherization spending and low-income household heating spending for 1983 and 1984 indicates that for a payback of investment in 7 years, the states would require an annual reduction in heating fuel use ranging from 18 to 65 percent based on 1983 expenditure data and from 17 to 50 percent based on 1984 expenditure data (see app. IV). For 1984 all but 3 of the 17 states needed to achieve annual energy savings of 24 percent or greater for a 7-year payback. For example, Pennsylvania, with an average weatherization expenditure per unit of almost \$900 in 1983 and an average annual low-income heating expenditure of almost \$700 per unit would require a potential 18-percent reduction in annual heating fuel use for a 7-year payback of investment. In contrast, Washington, with an average weatherization expenditure per unit in 1983 of almost \$1,500 and less than half the heating expenditure of Pennsylvania, would require a potential 64-percent reduction in annual heating fuel use.⁴

Although all but 3 of the 17 states would require potential annual heating fuel reductions of 24 percent or more for a 7-year return of investment, 1 DOE study and 10 state studies we analyzed claimed annual fuel savings ranging from about 8 to 22 percent (see app. V). Only 1 state study claimed annual savings over 20 percent, and 7 of the 11 studies were in the 8- to 14-percent savings range.

The shortcomings of 7 of the 10 state studies made it unlikely that their results were representative of the states. The principal shortcomings related to (1) sample areas covering only small areas of a state, (2) sampling inadequacies such as

³Our application of this payback criteria method does not take into consideration two factors--one of which would tend to overstate the value of energy savings and the other which would tend to understate actual energy savings. One factor not considered in our method is discounting the value of future energy savings, which tends to overstate the value of our energy savings. In addition, as previously stated, our method does not consider post-weatherization changes in behavior patterns affecting energy use (e.g., heating previously unheated rooms, increasing thermostat settings), which tends to understate our actual energy savings.

⁴In our calculations, we assumed that the amount spent for heat is proportional to the amount of fuel used. We did not consider any fixed cost component.

lack of a random sample, and/or (3) inadequate consideration of fuel use and/or climatic differences. The remaining 3 state studies and the nationwide DOE study claimed savings ranging from 10 to 14 percent.

These savings are consistent with those found in two studies of annual RCS energy savings in Minnesota and the Pacific Northwest.⁵ Average actual energy savings in the Minnesota study were 11 percent. Average annual energy savings in the Pacific Northwest study were 15 percent. Both studies found that, on average, only about two-thirds of the predicted energy savings due to the measures installed was actually realized. Among the possible reasons for this failure to attain the full potential energy savings are (1) inefficient installation of weatherization measures and (2) behavior changes on the part of occupants (e.g., heating previously unheated rooms, increasing thermostat settings).

POTENTIAL IMPACT OF A 7-YEAR PAYBACK

The impact of requiring a 7-year payback on weatherization investments (in terms of production and the number and type of measures installed) is difficult to assess because (1) the impact will vary considerably among and within states due to climatic and fuel cost differences, (2) as noted in chapter 2, weatherization measure priorities vary among the states, (3) data on average costs of installing the various measures, other than material cost, were not available, and (4) behavior varies across locations. However, by making certain assumptions, we can make a general estimate of the impact.

If we assume that when the average annual heating expenditure is \$1,000, by spending \$1,000 per unit for weatherization we can achieve a 14-percent energy savings--the upper level of DOE and three state studies with no significant shortcomings--then we will be achieving a 7-year investment payback. This level of investment could probably only allow, at most, the installation of the first three or four measures. Spending above that level for additional weatherization measures with this assumed level of heating expenditure will not achieve a 7-year investment payback because the additional expenditure is not likely to produce the necessary additional fuel cost savings. And in states where heating expenditures are

⁵Comparison of Actual and Predicted Energy Savings in Minnesota Gas-Heated Single Family Homes, Oak Ridge National Laboratory, ORNL/CON-147, March 1984; and Comparison of Actual Electricity Savings with Audit Predictions in the BPA Residential Weatherization Pilot Program, Oak Ridge National Laboratory, ORNL/CON-142, November 1983.

appreciably lower, the average fuel savings from any particular weatherization measure are likely to be less. Therefore, even fewer measures--perhaps only caulking, weatherstripping, and attic insulation--at a lower expenditure level are likely to generate enough fuel savings to achieve a 7-year payback. However, a concentration of effort on the higher priority measures should result in improved program cost-effectiveness and more units being completed.

For example, in 1983 Wisconsin completed about 5,900 units at an average expenditure of about \$2,100 and generally installed a wide range of measures. If the average expenditure had been halved, it is likely that (1) installed measures would have been limited to the top three or four priorities and (2) considerably more households would have been weatherized, but not to the same extent.

CONCLUSIONS

As noted in chapter 2, if current policies, funding levels, and expenditures per unit are continued, 15 of the 17 states will take from 15 to 100 years to weatherize their remaining low-income dwelling units. Comparison of the DOE low-income weatherization program with the RCS program indicates that the RCS program has payback criteria which, if applied to the DOE program, could make it more cost-effective.

Our analysis of 1984 data indicated that 14 of the 17 states reviewed would have to achieve potential annual heating use reductions of 24 to 50 percent for a 7-year payback of investment. The most reliable studies of residential conservation--both low-income and non-low-income--indicate energy savings of only 10 to 15 percent. Therefore, we believe that establishing a requirement that weatherization investment be repaid in potential energy savings within a specified period of years would place emphasis on installing the three or four highest and most cost-effective priorities. In most states the payback requirement would likely result in

--fewer measures being installed per unit, causing both the average expenditure and potential energy savings per unit to decrease and the potential energy savings per dollar spent to increase and

--more units being weatherized, causing total potential energy savings to increase.

RECOMMENDATION

We recommend that the Secretary of Energy consider revising current program regulations governing prioritization of

low-income weatherization program measures by establishing payback criteria. This would result in limiting weatherization measures to those that can be repaid through potential energy savings within the specified number of years. The appropriate number of years in the period could be based on a study of similar criteria in other programs and consultation with experts in the area.

AGENCY COMMENTS AND
OUR EVALUATION

We obtained official comments on this report from HHS and DOE. (See apps. VI and VII.) HHS replied that it had reviewed the report and had no comments to make on it. DOE believed that our recommendation has merit but that further study is needed to explore its impact on weatherization in the context of the multiple funding sources available.

Table 1.1: MAJOR FEDERAL FUNDING OF LOW-INCOME WEATHERIZATION EFFORTSFISCAL YEARS 1975-85Funding by Agency and Program

<u>Fiscal year</u>	<u>CSA low-income weatherization</u>	<u>DOE low-income weatherization</u>	<u>DOE petroleum overcharges allocated to weatherization</u>	<u>HHS LIHEAP allocated to weatherization</u>	<u>HUD Solar Energy and Energy Conservation Bank</u>	<u>Total</u>
----- (millions) -----						
1975	\$ 16.5	\$ 0	\$ 0	\$ 0	\$ 0	\$ 16.5
1976	27.5	0	0	0	0	27.5
1977	110.0	27.5	0	0	0	137.5
1978	65.0	65.0	0	0	0	130.0
1979	0	199.0	0	0	0	199.0
1980	0	199.0	0	0	0	199.0
1981	0	175.0	0	0	0	175.0
1982	0	144.0	0	136.2	21.9	302.1
1983	0	245.0	47.0	195.5	20.0	507.5
1984	0	190.0	0	195.9	25.0	410.9
1985	<u>0</u>	<u>191.1</u>	<u>0</u>	<u>211.1</u>	<u>15.0</u>	<u>417.2</u>
Total	<u>\$219.0</u> =====	<u>\$1,435.6</u> =====	<u>\$47.0</u> =====	<u>\$738.7</u> =====	<u>\$81.9</u> =====	<u>\$2,522.2</u> =====

Table II.1: LIST OF STATES INCLUDED
IN GAO'S REVIEW

<u>State</u>	<u>Scope of review work</u>	
	<u>Detailed</u>	<u>Limited</u>
1. California		X
2. Illinois	X	
3. Indiana		X
4. Iowa		X
5. Kentucky		X
6. Maine	X	
7. Massachusetts	X	
8. Michigan	X	
9. Minnesota	X	
10. Missouri		X
11. New Jersey		X
12. New York		X
13. Ohio		X
14. Pennsylvania		X
15. Tennessee		X
16. Washington		X
17. Wisconsin	X	

Table III.1: NUMBERS OF UNITS WEATHERIZED BY EACH OF
THE 17 STATES UNDER THE DOE AND LIHEAP^a PROGRAMS
FISCAL YEARS 1982-84

State	FY 1982		FY 1983		FY 1984	
	DOE	LIHEAP	DOE	LIHEAP	DOE	LIHEAP
California	4,360	4,823	3,085	7,208	10,825	12,000
Illinois	10,071	3,974	3,294	10,946	7,982	8,186
Indiana	3,652	-	10,261	10,041	6,265	4,464
Iowa	5,375	1,042	4,467	6,340	4,559	2,480
Kentucky	2,540	1,880	1,664	3,064	2,695	2,283
Maine	2,322	2,911	2,227	3,095	2,360	2,597
Massachusetts	2,322	37,477	3,881	28,463	3,925	31,070
Michigan	7,516	6,180	13,010	6,875	14,369	2,725
Minnesota	14,009	9,503	16,168	4,900	16,470	2,121
Missouri	6,451	4,000	4,963	3,259	5,581	4,200
New Jersey	4,708	258	1,277	5,056	7,666	11,000
New York	13,815	272,030	9,318	262,381	22,819	12,078
Ohio	4,821	22,043	12,143	14,957	14,681	14,639
Pennsylvania	16,685	4,411	6,740	25,266	11,307	32,835
Tennessee	2,371	2,293	2,901	3,606	2,404	795
Washington	1,645	1,110	1,197	2,524	2,797	3,388
Wisconsin	4,748	3,733	5,907	5,835	6,815	6,828
Total	<u>107,411</u>	<u>377,668</u>	<u>102,503</u>	<u>403,816</u>	<u>143,520</u>	<u>153,689</u>

^aDOE and LIHEAP data cannot necessarily be added to show total production because at least two states (Massachusetts and New York) indicate that LIHEAP production consisted mostly of units receiving only low-cost weatherization or furnace retrofit.

Source: DOE data obtained from Weatherization Assistance Programs Division, DOE. LIHEAP data from HHS annual reports on LIHEAP.

Table IV.1: ANNUAL ENERGY SAVINGS REQUIRED IN EACH OF THE
17 STATES IN GAO'S REVIEW FOR A 7-YEAR PAYBACK

1983-84

<u>State</u>	Annual energy savings percentage required for a 7-year payback	
	<u>1983</u>	<u>1984</u>
California	55	50
Illinois	40	28
Indiana	30	28
Iowa	20	17
Kentucky	65	50
Maine	21	24
Massachusetts	25	24
Michigan	30	30
Minnesota	23	25
Missouri	44	30
New Jersey	23	17
New York	35	36
Ohio	45	39
Pennsylvania	18	18
Tennessee	49	35
Washington	64	48
Wisconsin	43	35

Source: Calculated by GAO on the basis of data collected for each of the 17 states on (1) average costs of weatherizing households for 1983 and 1984 obtained from state weatherization agencies and (2) average heating costs for low-income households in 1983 and 1984 from an HHS report, The Low-Income Home Energy Assistance Program, February 29, 1984, pages 16-17.

Table V.1: LIST OF SELECTED STATE AND DOE ENERGY SAVINGS STUDIESANALYZED BY GAO AND SIGNIFICANT PROBLEMS NOTED

	Estimated annual energy savings as a percentage of total use of main home heating fuel	<u>Significant problems on study validity</u>		
		<u>Sample area covers only small area of state</u>	<u>Sampling inadequacies</u>	<u>Inadequate consideration of fuel use and/or climatic differences</u>
1. Illinois	7.8	X	X	X
2. Indiana	13.1	X		X
3. Kentucky	16.0			X
4. Maine	12.7		X	
5. Massachusetts	18.7			X
6. Minnesota	14.4			
7. New York	22.3		X	
8. Ohio	12			
9. Washington	18.2	X	X	X
10. Wisconsin	9.8			
11. DOE-nationwide	10.4			

Source: GAO analysis of energy savings studies obtained from states and DOE.

ADVANCE COMMENTS FROM
THE DEPARTMENT OF ENERGY

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



Department of Energy
Washington, DC 20585

15 AUG 1985

Mr. J. Dexter Peach
Director, Resources, Community and
Economic Development Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Peach:

The Department of Energy appreciates the opportunity to review and comment on the General Accounting Office (GAO) draft report entitled "Low-Income Weatherization--Better Way of Meeting Needs in View of Limited Funds."

See comment 1.

The Department believes that GAO's finding may have some merit, but that further analysis would be required to explore how such an action would impact the weatherization of homes in the context of the multiple funding sources for this effort. Although GAO references funds from the fuel assistance program, the solar and conservation bank and oil overcharge monies, no findings or recommendations are made in these areas. Some of the issues raised in the GAO report, i.e., the effect of client behavior on energy savings and why actual energy savings are lower than projected savings, are currently being addressed as part of the program's evaluation activities.

DOE hopes that these comments will be helpful to GAO in its preparation of the final report.

Sincerely,

Martha Hesse Dolan
Assistant Secretary
Management and Administration

The following are GAO's comments on the Department of Energy's letter dated August 15, 1985.

GAO COMMENTS

1. DOE noted that we refer to three other sources of funds for weatherization, but that we make no findings or recommendations in these areas. We believe that the report gives adequate justification for having no recommendations on the three programs providing these funds.

Concerning LIHEAP funds used for weatherization, we noted that no recommendation was made because the pertinent act and regulations have given the states the responsibility for establishing cost and measure criteria. We plan to distribute copies of the report to state governors so that they may consider the merits of our recommendation. We believe that this coupled with DOE action on our recommendation could convince states of the merits of voluntarily applying this recommendation to the use of LIHEAP funds for weatherization.

Concerning Petroleum Violation Escrow funds allocated by states to DOE weatherization, we noted that these funds are subject to DOE weatherization program regulations. Therefore, changes made to DOE's regulations resulting from our recommendation would automatically apply to Petroleum Violation Escrow funds allocated to weatherization.

Concerning the Solar Energy and Energy Conservation Bank, we noted that our review did not include weatherization funded by the Bank because the program (1) had only recently been initiated by the states at the time our review began and (2) differed significantly from the other programs in income eligibility, allowable measures and costs, and method of implementation. We believe that the Bank's method of implementation would preclude it from being a major source of multiple funding of the weatherization of dwelling units. The Bank operates through local financial institutions that make loans or grants to individual homeowners. The Bank does not use the local weatherization agencies through which the DOE and LIHEAP programs operate. Therefore, the local weatherization agencies have no access to the Bank's funds and cannot use them to finance measures unallowable under DOE regulations.

ADVANCE COMMENTS FROM
THE DEPARTMENT OF HEALTH AND HUMAN SERVICES



DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of Inspector General

Washington, D.C. 20201

AUG 21 1985

Mr. Richard L. Fogel
Director, Human Resources
Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Fogel:

The Secretary has asked me to respond to your draft report, "Low-Income Weatherization -- Better Way of Meeting Needs In View of Limited Funds."

Department officials have reviewed this report with interest and have no comments to make, other than technical comments which have been separately provided to your staff.

Thank you for the opportunity to respond to your report before its publication.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Richard P. Kusserow".

Richard P. Kusserow
Inspector General

(308761)

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